

The Invasive Species Forecasting System (ISFS): An iRODS-Based, Cloud-Enabled Decision Support System for Invasive Species Habitat Suitability Modeling

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Abstract

The Invasive Species Forecasting System (ISFS) is an online decision support system that allows users to load point occurrence field sample data for a plant species of interest and quickly generate habitat suitability maps for geographic regions of interest, such as a national park, monument, forest, or refuge. Target customers for ISFS are natural resource managers and decision-makers who have a need for scientifically valid, model-based predictions of the habitat suitability of plant species of management concern. In a joint project involving NASA and the Maryland Department of Natural Resources, ISFS has been used to model the potential distribution of Wavyleaf Basketgrass in Maryland's Chesapeake Bay Watershed.

Maximum entropy techniques are used to generate predictive maps using predictor datasets derived from remotely sensed data and climate simulation outputs. The workflow to run a model is implemented in an iRODS microservice using a custom ISFS file driver that clips and re-projects data to geographic regions of interest, then shells out to perform MaxEnt processing on the input data. When the model completes, all output files and maps from the model run are registered in iRODS and made accessible to the user.

The ISFS user interface is a web browser that uses the iRODS PHP client to interact with the ISFS/iRODS server. ISFS is designed to reside in a VMware virtual machine running SLES 11 and iRODS 3.0. The ISFS virtual machine is hosted in a VMware vSphere private cloud infrastructure to deliver the online service.

